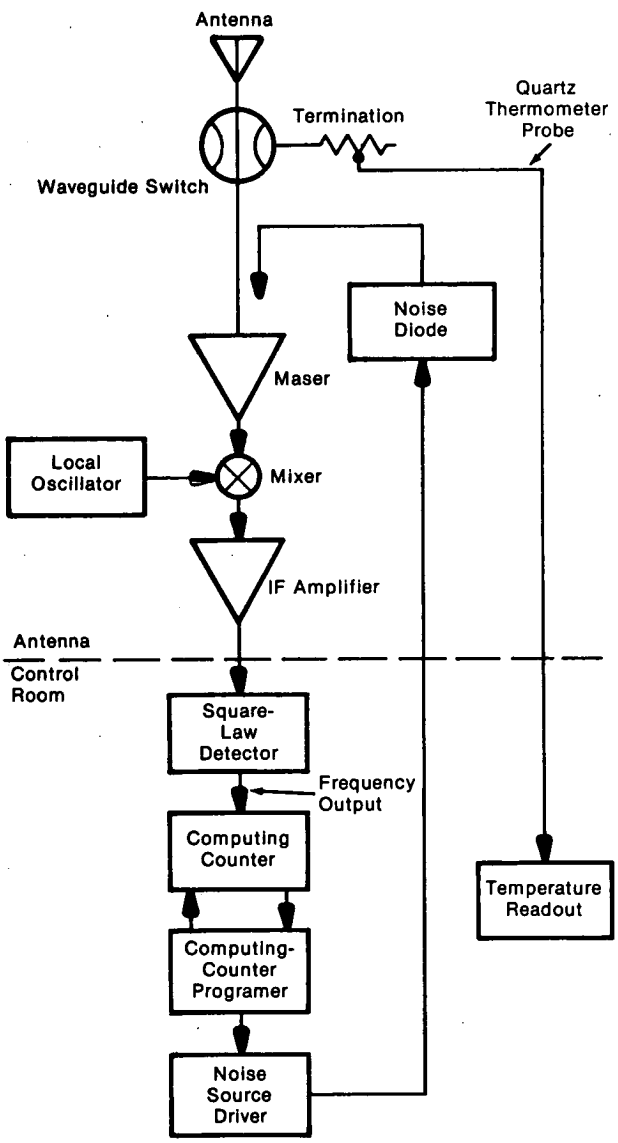
NASA TECH BRIEF
NASA Pasadena Office

High-Accuracy Programable Square-Law Detector System



Block Diagram of Square-Law Detector System Used as Radiometer

A new square-law detector system improves detector accuracy to better than 0.3 percent. The system incorporates a square-law detector unit described in NASA Tech Brief B75-10180; the unit by itself is accurate to 3 percent.

Basically, the programable detector system introduces a correction factor to compensate for detector deviation from the square-law response. If the detector output voltage is V, the corrected output voltage is generally determined as follows:

$$V_{corrected} = V + aV^2$$

where a is the correction factor. This factor is determined and used automatically with digital computer techniques.

One such scheme is illustrated in the block diagram as it is being used in radiometric measurements of a microwave antenna system. The setup included in the control room includes a square-law detector, a computing counter, a computing-counter programer, a noise-source device, and other related equipment. A signal received from the IF amplifier is detected and fed to the computing counter.

The programer commands the noise-source driver to turn the noise diode on and off and computes the ratio:

$$Y = \frac{V_2 + aV_2^2}{V_1 + aV_1^2} \qquad (1)$$

where V_2 and V_1 are the detector output voltages with the noise diode on and off, respectively. This ratio is then used by the programer to compute system operating noise temperature T_{op} from

$$T_{op} = \frac{T_n}{Y - 1} \qquad (2)$$

where T_n is the equivalent injected noise temperature from the noise diode.

(continued overleaf)

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP75-10240

Patent status:

NASA has decided not to apply for a patent.

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(NPO-13525)